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Postoperative analgesia and flap perfusion after pedicled TRAM flap reconstruction – continuous wound instillation with ropivacaine 0.2%. A pilot study

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Summary Transverse rectus abdominis musculocutaneous (TRAM) flap surgery is a complex procedure characterised by an extensive wound site. We present a pilot study with 17 patients receiving continuous wound instillation with ropivacaine or isotonic saline.

Patients undergoing TRAM flap surgery were included in the study and randomised to the ropi group or the control group. Two catheters were placed subcutaneously before wound site closure. At the end of surgery patients received a single shot dose of 20 ml ropivacaine 0.2% or isotonic saline. After surgery the continuous instillation of ropivacaine or isotonic saline was commenced at an infusion rate of 10 ml/h per catheter. The perfusion of the TRAM flap was measured intraoperatively and postoperatively over 48 h. Pain scores, patient satisfaction, and the quality of recovery score were also assessed postoperatively over 48 h. Ropivacaine plasma levels were quantified 24 and 48 h after start of infusion.

Pain scores at rest and on coughing were lower for the ropi group and reached significance in the first 8 h at rest ($P = 0.007$). Patient satisfaction, quality of recovery score, and adverse events were also comparable between the groups. Patients of the ropi group had bowel movement earlier than the control group ($P = 0.003$). No differences were seen in the flap perfusion. Ropivacaine plasma levels were within therapeutic range.

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Our data show a trend that continuous wound instillation of ropivacaine 0.2% increases pain relief after TRAM flap surgery with earlier bowel movement than intravenous opioid patient controlled analgesia (IV-PCA) alone. A does of 960 mg of ropivacaine daily did not result in toxic plasma concentrations. Ropivacaine 0.2% did not show a vasoconstrictor effect.

The transverse rectus abdominis musculocutaneous (TRAM) flap reconstruction has increased in popularity for autologous breast reconstruction because of perceived superior aesthetic results that can be obtained compared with implant reconstruction.[1] TRAM flap surgery is characterised by an extensive wound site as the breast mound is created from skin and fat between the umbilicus and suprapubic area.

Postoperative analgesic regimens like intravenous opioid patient-controlled analgesia (IV-PCA) and thoracic epidural analgesia (TEA) have proved effective techniques after major surgery. It is supposed that IV morphine PCA is an inadequate method of pain control for the level of pain experienced after TRAM flap surgery as some patients are unable to titrate themselves to a comfortable, pain-free level.[2] Previous case reports of our study group[3] led to the assumption that wound instillation with ropivacaine 0.2% is an effective and well tolerated method for postoperative analgesia after TRAM flap reconstruction. We conducted a pilot study in a prospective, double-blinded, randomised, and controlled design to support our hypothesis.

Patients and methods

This was a prospective comparison of patients receiving ropivacaine 0.2% (ropi group) or isotonic saline (control group) as a bolus during TRAM flap surgery and postoperatively as continuous wound instillation via two catheters. The study protocol and the consent form were approved by the ethics committee of the University of Cologne.

Patients and anaesthesia

Female patients older than 18 years with previously diagnosed breast cancer undergoing TRAM flap reconstruction were included in this trial. All patients gave written, informed consent to participation. Participants required the ability to speak and write German. Patients with severe psychiatric or neurological diseases or drug abuse were excluded.

Randomisation was based on a computer-generated code prepared at a remote site and sealed in sequentially numbered, opaque envelopes.

Patients fasted for 6 h preoperatively and were given a premedication of oral midazolam (typically 7.5 mg) 30–45 min before induction of anaesthesia. Upon arrival in the anaesthetic room routine monitoring was applied and peripheral venous access was established. A maintenance infusion of normal saline was given. General anaesthesia was induced and maintained with propofol and remifentanil. After administration of an intubation dose of mivacurium, patients' lungs were intubated with an orotracheal tube and ventilated using a Sulla® anaesthetic machine (Dräger Medical AG & Co. KG, Lübeck, Germany).

Surgical technique and placement of wound drains

The rectus sheath was closed directly without use of inlay mesh. Contralateral plication of the rectus sheath was performed to minimise fascial resection and to restore symmetry to the umbilicus. Three silicone drains, 12Ch/4 mm (Pfm, Cologne, Germany) were placed into the wound site, one drain over the pectoralis major muscle under the flap, and two drains over the fascial sheath into the abdominal wound (Figure 1). All wound drains were without suction.

Catheter placement and study medication

Before wound closure was finished, the catheters with a distribution length for local anaesthetics of 12.5 cm (Pain-Buster Soaker™, Pain management system, I-Flow Corporation, Lake Forest, USA) were placed with split introducer needles: one catheter was sited subcutaneously into the abdominal wound through the umbilicus ('abdominal catheter', Figure 1). This abdominal catheter was placed in a loop over the fascial sheath to reach not only the abdominal wound, but also the intercostal nerves (Figure 1). The second catheter was placed in a loop over the pectoralis major muscle under the autologous flap ('flap catheter', Figures 1 and 2), extending into the axilla. The exact position of the catheters is shown in Figure 1.

Twenty minutes before the end of the surgical procedure, 10 ml of ropivacaine 0.2% was injected through each catheter. After patients' arrival in the recovery area, continuous wound instillation with ropivacaine 0.2% was commenced. The catheters were connected to two continuous infusion devices (Multifuse®, B.Braun Melsungen AG, Melsungen, Germany) and 10 ml/h ropivacaine 0.2% were administered via each catheter. The control group received isotonic saline at the same infusion rate as ropivacaine 0.2%.

All patients had unrestricted access to opioid rescue medication via an IV-PCA device (Multifuse, B.Braun Melsungen AG, Melsungen, Germany) with piritramide (1.5 mg bolus dose, 6 min lock-out time, 30 mg dose limit over 4 h). Piritramide is an opioid commonly used in Europe with approximately 0.7 times the potency of morphine.

The investigators involved in the operation and the postoperative care (A.H. and M.W.) were blinded regarding the content of the study medication. The pain management catheters were removed on the second postoperative day.